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ABSTRACT

The report summarizes a project investigating effects of biofeedback on nine secondary students with speech problems including stuttering, vocal nodules, articulation problems, and cerebral palsy. It is explained that a portable electromyograph was used to give the students immediate visual and/or auditory feedback. Results listed include that Ss lessened their number of misarticulations, Ss found talking was easier as they became more relaxed, and Ss who stuttered could lessen the severity of their repetitions and/or blocks but did not necessarily reduce their frequency of repetitions. Project costs, resources, and activities are charted and briefly discussed. (CL)

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"Use of an Electromyograph Biofeedback Unit to Facilitate Awareness in Selected Students in Speech Therapy"

by

Patricia Hanns
Speech Pathologist, Secondary Schools
Salem Public Schools
Salem, Oregon
1978-79

Teacher Incentive Grant
Title IV, Part C

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EC130855

Support Takes Different Forms--Interest,
Encouragement, Financial, and Cooperation

This Project was Possible Because of Support from the Following People

Jeff Kurtz, Director TIP
Wallace Turnidge, Assistant Superintendent, Area II
Ray Myers, Supervisor, Student Services
Carroll Smith, Coordinator, Speech, Hearing, and Vision
Fred E. Newton, Coordinator, Curriculum Planning
Beryl Broderson, Vice Principal, McNary High School
Robert Donovan, Principal, Leslie Junior High School
Winston Miller, Administrative Assistant, Sprague High School
David Putnam, Principal, Walker Junior High School
Tom Pickens, Principal, North Salem High School
Virginia Bartsch, Curriculum Library
Fritz B. Miller, M.D., Oregon State Hospital, Salem
John Nance, Ph.D., The Growth Place, Salem
Leonard Yospe, Ph.D., Northwest Pain Center, Portland
Linda Bottfeld, Speech Pathologist, Vernonia, Oregon
Carol Curran, Woodland Park Hospital, Portland
Sue Skjersaa, Portland, Oregon
Gerald Stein, Ph.D., Southern Oregon College of Education, Ashland, Oregon

Parents of Students

Students Who Were Enthusiastic and Willing Participants

Project Teacher

Patricia Hanns is completing her 12th year as a speech pathologist with the Salem Public Schools. She received her BA degree from the University of Oregon. Since that time she has taken 96 hours beyond her degree, as well as participating in workshops designed to further her professional training. She holds teaching certificates in speech, special education, and secondary teaching, including counseling. It is her belief that if we are going to change the world, let it be with a mark that bears our intelligence.

Statistical Information
Acknowledgments
Project Teacher

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Note: An asterisked (*) section is optional.

1.0 Introduction

1.1 Project Problem:

The problem was that students identified as speech handicapped were not having the success they wanted in correcting their speech problems. Most of the students had been in speech therapy since primary grades. Their speech problems were well diagnosed. Prior speech therapy had involved strong visual and auditory approaches. It was our conviction that we needed another approach along with the auditory and visual to teach students. It was our belief that kinetic awareness was such an approach. In the fall of 1978, 45 students were identified in two junior highs and four high schools who needed speech services. In October, 9 students were selected to participate in the biofeedback project. These students were working on problems which included stuttering, vocal nodules, inability to make an "s" sound, and cerebral palsy.

1.2 The project goals were:

1.2.01 To increase student understanding that reduction or increase of muscle tension affects speech.

1.2.02 To gain voluntary control over this muscle tension.

1.2.03 To learn a relaxation procedure.

1.2.04 To use this new knowledge and the relaxation skills in everyday speech situations.

1.3 Solution:

The basic approach was to purchase a portable electromyograph made by J & J Enterprises in Poulsbo, Washington. This equipment is designed to measure small changes in muscle tension. This is done by way of placing two small sensors on the muscle being monitored. Adhesive discs hold the sensors in place. The EMG gives the student immediate visual and/or auditory feedback. Knowing what their muscles are doing, the student can then change.

The EMG, along with other therapy approaches were used during regular weekly speech sessions. These lessons lasted about 50 minutes and were scheduled on top of the students' class schedules. EMG provided visual and auditory cues so the students could select the cues which facilitated their learning. It was, to an extent, self-instructing. The main task was to design situations for the individual which facilitated their learning.

1.4 Rationale:

The exciting subject to all of us is "self." The uses of the EMG biofeedback unit could stimulate in the students a refreshed interest in self awareness and change. They could in addition, see how their muscle tensions affect their speech performance. By having immediate feedback when they lessen or increase this tension could further assist them in overcoming their speech handicaps.

1.5 Results:

During the project, we learned the EMG biofeedback unit could be used successfully in a school setting. We also learned that:

1.5.01 Students lessened their number of misarticulations.

1.5.02 Students in general found talking was easier as they became more relaxed.

1.5.03 Students who stutter could lessen the severity of their repetitions and/or blocks but did not necessarily reduce their frequency of repetitions.

1.5.04 Students who stutter reduced their number of unnecessary concomitant speech behaviors.

1.5.05 Students who had cerebral palsy reported that talking was easier when they learned how to relax.

1.5.06 The EMG could be used as a diagnostic tool as well as in planning for habilitation.

1.6 Costs:

First year costs are greater due to need for additional teacher training and purchase of equipment. The adopted budget for this project is reported in item 2.7.

Second year costs for continuation of the project might be:

Equipment	
Supplies	$ 35.00
Replacement Parts	25.00
Continuing Education (2½ day) workshop	225.00
Conference fee (2½ days)	50.00
Lodging - 5 days X 30 =	150.00
Meals - 5 days X 15 =	75.00
Travel (approx.)	100.00
TOTAL	$660.00

2.0 Resources:

2.1 Staff

The delivery of services was provided by this writer. A school counselor was asked to be present during the parent conferences. At that time the EMG unit was demonstrated and the parent permission forms were signed. Initially, this project has required, on the average, an extra day per month for special meetings or conferences. It took another 3 hours per week to keep records and maintain communication with teachers, parents, administrators, the press, or other interested groups. This three hours per week also includes hours spent in compiling this report.

2.2 Training:

A great deal of planning had been done between January and May before we received official notification of the TIP Grant. This included observation and correspondence with others using biofeedback applications; and attendance at two biofeedback workshops designed to train beginning professionals in biofeedback theory and application. The possibility of a project had been discussed with a few students ahead of time. We wanted to be sure we had student interest. After the grant was awarded two additional workshops were taken. Concurrent with the February workshop was a meeting of the speech interest group of the Biofeedback Society of America. At that time project concerns and results were discussed with other professionals.

2.3 Materials Equipment:

During the summer arrangements were made with J & J Enterprises to purchase equipment and supplies. The unit selected was a portable model, No. M-55P. Along with the basic EMG unit, an extra cable and set of small electrodes were purchased. Other supplies used with the EMG were batteries, adhesive discs, cotton, alcohol, kleenex, and conductive gel. Later we stopped using the gel and purchased redux cream which had been suggested as more satisfactory. The equipment was easy to manage and lightweight.

WORKSHOPS-MEETINGS-CONFERENCES

2 day Biofeedback Workshop Portland, Oregon, Dr. George Fuller April, 1978

San Francisco Biofeedback Institute.
Dr. George Fuller - 4 day intensive training for out of state professionals
May, 1978

6/24/78 Oregon Biofeedback Society annual meeting. Mc Minnville

10/27-10/29/78 Two and one half day workshop Biofeedback Society of America San Antonio, Texas. Professional training in instrumentation, psychophysiology and clinical application.

10/21/78 Oregon Biofeedback Society--organizational meeting and speaker Dr. Steve Fahrion, Menninger Foundation. "Neurophysiological Model of Biofeedback."

2/23-2/27/79 Biofeedback Society of America, 10th Annual Conference. Overview of the field: philosophy, application, and research. Special speech interest group to discuss biofeedback use in speech and audiology.

2/27-3/1/79 Workshop training--Cognitive Restructuring: Dr. Eric Peper and Dr. Patricia Norris. Dr. Peper teaches Interdisciplinary Studies at the University of San Francisco. Dr. Norris works in the clinic at the Menninger Foundation.

3/6/79 Panel Participant, "Biofeedback" Mid Willamette Valley Speech and Hearing Association. Discussed project with other professionals in this area. Fritz Miller, M.D., and John Nance, Ph.D., completed the panel.

4/20/79 Program Participant, Oregon Speech and Hearing Association--state meeting Portland. Discussed project. Paper selected as meriting special attention.

As the project grew the above meetings and conferences were important in order to gain additional knowledge and meet others facing similar problems. As the project ended, the meetings were important as a way to discuss results and determine feasibility of continuing the project or changing direction.

2.7

School District 24J
Marion County, Oregon

1978-1979 Title IV, Part C, Teacher Incentive Program
Speech Handicapped Project

Special Revenue Fund 46, Source 839
District Budget for 7/1/78-6/30/79
Rpoject Administrator -
Ray Myers
Project Coordinator - Particia Hanns

Grand Award No. 9-075
Grand Dates 7/1/78-6/30/79
Grant Award $945.00

Estimated Revenue

46-904-839-000-000	Grant Award	$945.00

Estimated Expenditures

46-012-816-839-152	Aide Salary	$ 42.00	
46-012-816-839-342	Travel	360.00	
46-012-816-839-412	Supplies	78.00	
46-012-816-839-541	Equipment	465.00	
	Total Pupil Support		$945.00

As approved by the District School Board on September 12, 1978.

Actual Expenses

46-012-816-839-152	Aide Salary	$ 00.00	
46-012-816-834-342	Travel	360.00	
46-012-816-839-412	Supplies	98.60	
46-012-816-839-541	Equipment	454.00	
	Total Actual Expenses		$912.60

Itemized Expenses

Aide Salary:	$000.00	
Total Aide Salary		$000.00

Itemized Espenses (continue)

Travel:

October Workshop	$250.00	
February Workshop	110.00	
Total Travel Expenses		$360.00

Supplies:

Adheasive Disks	$77.00	
Creme	8.50	
Electrode Gel	4.00	
Micro Tape	3.85	
Miscellaneous:		
Kleenex		
Cotton		
Headband		
Batteries	5.25	
Total Supplies Expenses		$98.60

Equipment:

Electromyograph	$415.00	
Extra Cables	15.00	
Extra Small Electrodes	24.00	
Total Equipment Expenses		$454.00

Total Itemized Expenses	$912.60
Honorarium to Teacher	50.00
Total Spent	$962.60
Total Budgeted	995.00
Remaining	$ 32.40

Additional expenses paid by 24J. Including two workshops in April and May of 1978 and one workshop February 1979.

Registration	$ 725.00
Transportation	253.00
Lodging	150.00
Meals	48.00
Total	$1,1176.00

Additional expenses paid by applicant.

Transportation	$272.00
Lodging	239.00
Meals	90.00
Total	$601.00

10

3.0 Activities:

3.1 Setting Up:

In September, conferences were held with the students. The EMG was shown to them, and its operation was explained. If the student was still interested, an appointment was made with the parent. They were likewise shown the unit, and its operation was described to them. We asked that they sign a permission form which would allow the student to use the electromyograph if they so chose. Regular weekly appointments were scheduled which lasted about 50 minutes.

3.2 Operating:

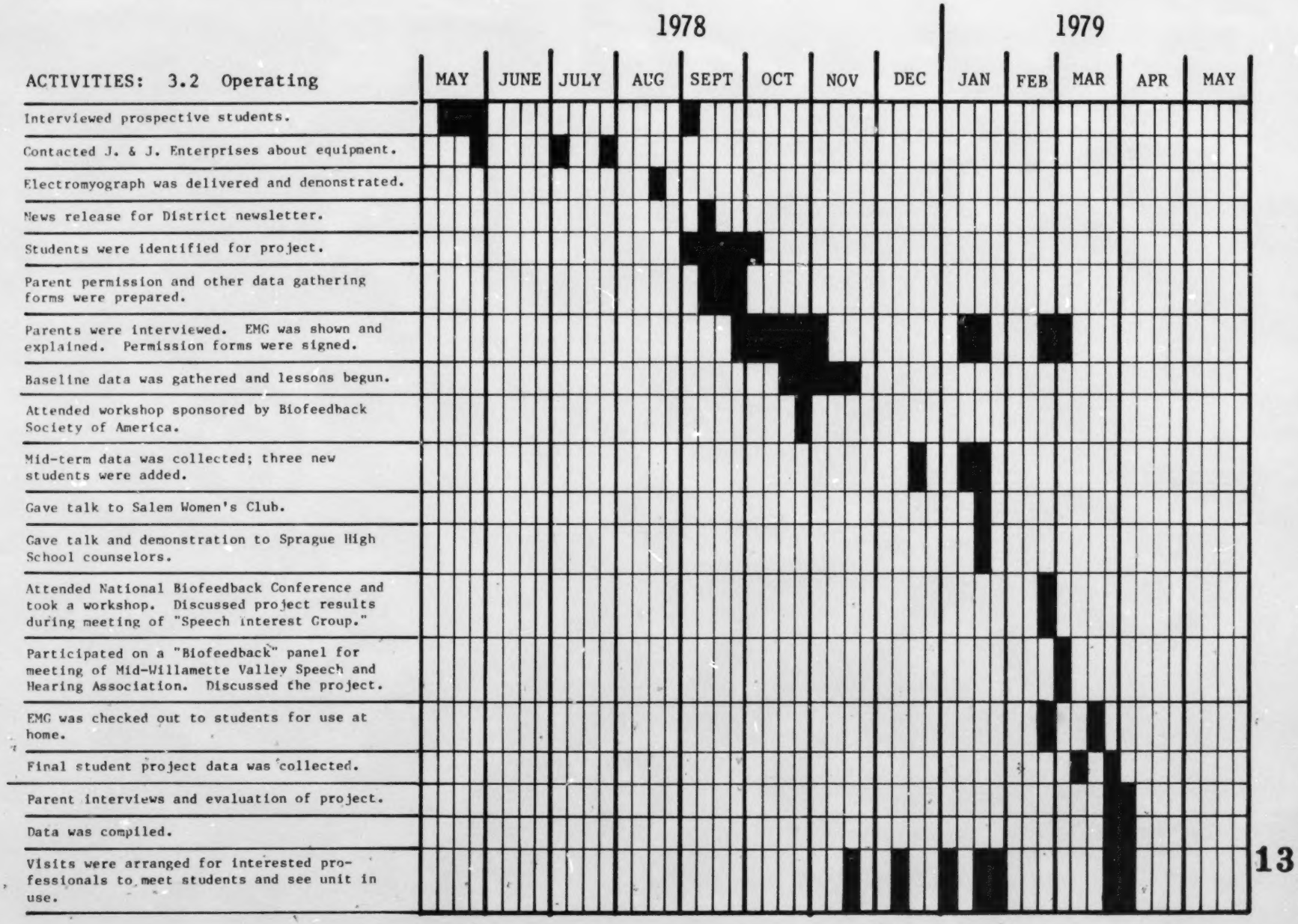
On the first day sensors were placed on the frontalis muscles to measure upper body tension. At the same time, the student was given a series of speech activities. These activities were given in October, December, and March so that pre- and post-test data was recorded. The activities varied depending on the speech disorder. In all cases, an articulation test was administered. Levels of tension were also recorded.

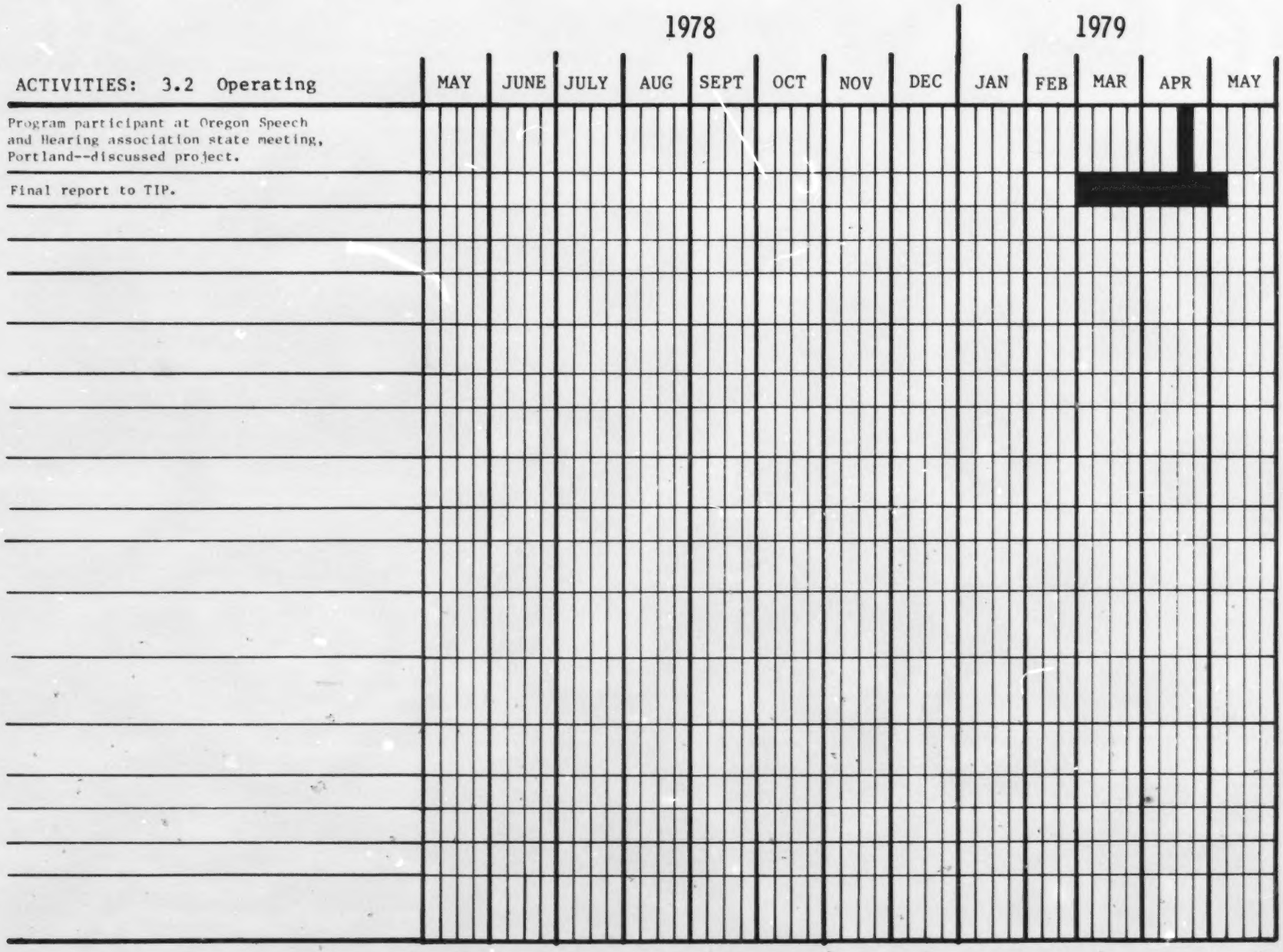
After the baseline data, lessons focused on two areas of concern: increasing sound accuracy and ease in speaking, by reducing or increasing muscle tension.

The EMG provided the method, the motivation, the feedback, and reinforcement.

If decreasing tension was the purpose, as with stutterers, the sensors were placed on specific tight muscles in the throat or on the face. The student, while talking, was instructed to lower the tension level. "Bring the needle down." If the purpose was to increase tension, i.e., 's' misarticulation, the student was instructed to tighten tongue or obicularis muscles while aiming for increased 's' accuracy.

Additional activities and when they were carried out are listed on the next page.


1978
1979
ACTIVITIES: 3.2 Operating
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
Interviewed prospective students.
Contacted J. & J. Enterprises about equipment.
Electromyograph was delivered and demonstrated.
News release for District newsletter.
Students were identified for project.
Parent permission and other data gathering forms were prepared.
Parents were interviewed. EMG was shown and explained. Permission forms were signed.
Baseline data was gathered and lessons begun.
Attended workshop sponsored by Biofeedback Society of America.
Mid-term data was collected; three new students were added.
Gave talk to Salem Women's Club.
Gave talk and demonstration to Sprague High School counselors.
Attended National Biofeedback Conference and took a workshop. Discussed project results during meeting of "Speech Interest Group."
Participated on a "Biofeedback" panel for meeting of Mid-Willamette Valley Speech and Hearing Association. Discussed the project.
EMG was checked out to students for use at home.
Final student project data was collected.
Parent interviews and evaluation of project.
Data was compiled.
Visits were arranged for interested professionals to meet students and see unit in use.


1978
1979
ACTIVITIES: 3.2 Operating
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
Program participant at Oregon Speech and Hearing association state meeting, Portland--discussed project.
Final report to TIP.

3.3 Maintaining:

Throughout the year opportunities were taken to demonstrate the equipment to individuals, principals, counselors, teachers, other interested adults, and groups if they expressed interest. In January calls were received from strangers who had heard about the project and wanted more information.

3.4 Timeline:

The project follows the time and guidelines described in the original proposal with the following exceptions. The use of aides was not a workable idea. Student schedules were tight. One 50-minute session per week was arranged rather than two shorter sessions. Since the unit was needed by students who were in different schools, it was carried by this clinician most of the time. However, in March over holidays and weekends, students were allowed to check the unit out for use at home. The number of students included in the project was increased from 9 to 12. Two of the original students dropped out of school during the first semester. Of the remaining seven, enough of them were making such rapid progress it seemed appropriate to include others.

3.5 Potential Hazards:

3.5.01 That we might not have a space secure from interruptions.

3.5.02 That the students might not accept the EMG.

3.5.03 That the parents might not accept the use of the EMG in speech therapy in the school setting.

3.5.04 That the EMG unit would be difficult to use.

3.5.05 That the EMG data would be meaningless and difficult to interpret.

3.5.06 That the timelines were unrealistic.

None of the above have turned out to be problems. I believe the project ran as smoothly as it did because the district allowed for and supported this clinician's attendance at workshops designed to train beginners in the use of biofeedback. Problems were identified ahead of time, and appropriate planning was done.

4.0 Assessment:

4.1 Assessment Design:

The students were given three tests--a pretest, a mid-term, and a final. Parents were asked to discuss the project with their children and fill out a final evaluation questionnaire. The results are reported on a following page.

4.2 Recordkeeping:

Daily records were kept of student activities. In addition the writer kept a log of clinician activities, highlights, and concerns. Forms are included under section 5.3.

4.3 Analysis of Results:

The motivation to apply for the TIP Grant was that the students were not having the success they wanted in correcting their speech handicaps; we wanted to try a new approach. What would not have happened, without this new approach, is the subject of the remainder of this report.

One student reported that he had a problem getting words out. His blocking was not severe enough to be noticed by clinicians in the past, or even his teachers. His parents, however, had noticed that he had a speech problem of some sort. They had not asked for prior assistance. When this 15 year-old boy came for the first visit it was difficult to determine how he could be helped. However, as he talked about his nervousness, tension increased around his mouth, which he also identified as a point of tension. He had read about the EMG unit in a school newsletter, and was sure it would help him. While using the EMG and within four sessions, he saw that when he was talking about something uptight he was uptight, and when he was talking about being relaxed, he was relatively relaxed. Later he learned to consciously relax tense facial muscles. By December he reported that he believed he could remain relatively relaxed in most uptight situations.

In the cases of two cerebral palsy students, they knew they had more tension than they needed. They reported that they had been counseled in the past about relaxing. However, talking about relaxing with them wasn't the same as putting sensors on those tight muscles so they could see when they were tense, as well as when they were relaxing. As one of those students reported, "I've been told before to relax, but I didn't know what I had to do or if I was doing it." The other said, "This is as easy as going to sleep, almost."

Another student who had an "s" articulation problem, had had difficulty with this problem since he was in the first grade. With the use of the EMG in the seventh grade, in eight lessons, he was able to get a feeling for what it was to make a good "s." By December he was working successfully on carry over, and in January he was scheduled for monthly visits. This boy's mother was present during most of the speech sessions, which undoubtedly facilitated his learning and carryover.

A student referred in October because of vocal nodules caused by vocal abuse, discovered that much of her daily tension was being carried in her throat. The student didn't have to be talking to be uptight. Thinking thoughts could cause as much measurable tension in her laryngeal area as her talking. The student, with this awareness, began practicing conscious throat relaxation. She was practicing this relaxation at the same time she had the lead in a school play and sang in over 20 school concerts. In January her voice had returned to normal. She made an appointment with her doctor who told her the vocal nodules were gone.

Finally, a student who stuttered was able to identify the groups of muscles that were in tension when he was stuttering, and learned to relax them. This student further reported that he had always been able to change, if he knew what it was he was supposed to change.

The TIP Grant provided the motivation to pursue an idea which had been in the back of my mind for several years. It provided the money to buy the out-of-the-ordinary equipment so the idea could be field tested. Clinician training was equally important, TIP recognized this by allowing workshop fees to be included as a budgeted item.

There is no question that the electromyograph provided an important approach in the modification and correction of students' speech problems.

Success of the project was further assured by the opportunities for clinician training and understanding which were shared with the students and their parents.

After this experience, it's hard to imagine speech therapy without an EMG. This purchase is highly recommended to other school districts, assuming they will recognize that along with the equipment they need an interested clinician willing to be trained.

4.3

SA - Strongly agree
A - Agree
U - Uncertain
SD - Strongly Disagree

P - Parent
S - Student
C - Clinician
Total # of Students 10

PARENT QUESTIONNAIRE

1. Student's speech has improved.
2. Student enjoyed working in the biofeedback project.
3. Student no longer needs speech services.
4. Student would like to continue in the project.

SA	A	U	D	SD
////1	///		/	
////	//	///		
	//	/	////	//
////\		/	/	

/-NO LONGER NEEDS SERVICE

	PARENT	STUDENT	CLINICIAN
Like	"Student seems more confident. Has a more positive attitude." "Talks and jokes more." "At times he seems more relaxed in every way." "Enabled him to exercise the necessary muscles so as to emit sounds correctly. He progressed very quickly." "The speech program has helped my child greatly."	"It taught me to calm down." It taught me to talk easy." "I could see the way I reacted." "I liked finding out where my bad tension areas were." "If it weren't for the EMG, I wouldn't have found out where I'm stressing and how to take it down." "Sitting back and relaxing." "I made my muscles uptight for no reason." "It helped me know where to place my tongue." "It showed me that I had tension where I wouldn't expect it."	Could tell when methods were working. Positive learning could be reinforced. lightweight portable easy to read data Students who stutter began talking more--noticed increased spontaneous conversation. All students felt successful.
Dislike		"Creating tension." "It didn't work right when I took it home." "The alcohol smell." "When I couldn't get the needle down."	When the sensors fell off. Alcohol caused skin to redden on two students.
Other Comments	"I'm pleased my child had this opportunity. I'd like him to continue." "We are pleased with the success of the treatment. We hope what has been learned will have a life long affect on child's health and attitude toward self-awareness." "The machine only identified the muscle/speech connection."	"I think everyone in my condition (cerebral palsy) should have this opportunity to work with the EMG and to learn how to control yourself." "It made it easier to learn how to make the 's' sound. It was easier to use my tongue. I used to not use my tongue that much."	The benefits outweighed any hassels connected with carrying another piece of equipment.

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5.1 Journals

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3. Green, Elmer H., Schnider, Carol J., Wilson, Edgar S., Stroebel, Charles F., Wickram, Ian et. al. Fourth Annual Biofeedback Workshop for Professionals, San Antonio, Texas; The Biofeedback Society of America, 1978.

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6. Prosek, Robert A., Montgomery, Allen A., Waeder, Brian E., Schwarts, Daniel M., "EMG Biofeedback in the treatment of Hyperfunctional Voice Disorder." Journal of Speech and Hearing Disorders, 1978, Volume 43, pp 282-294.

7. Webster, Ronald L. "The Establishment of Fluent Speech through the Functional Relaxation of Vocal Movements in Stutters." Tension Control: Proceedings the Third Annual Meeting, 1976, pp 47-53.

5.2 Equipment and Supplies:

J & J Enterprises
22797 Holgar Court, NE
Poulsbo, WA 98370
Attention: John Watt (206)-779-3853

Hewlett Packard
17890 Southwest Boones Ferry Road
Tualatin, OR (Redux Creme) 620-3350

Professional:

Jeff Kurtz
Director, Teacher Incentive Project
200 North Monroe Street
Eugene, OR 97402 687-3353

Biofeedback Society of Oregon
c/o Dr. Robert Yokom
2043 College Way
Forest Grove, OR 97116

Biofeedback Society of America
U.C.M.C. C268
4200 East 9th Avenue
Denver, CO 80262

Oregon Speech and Hearing
c/o Robert L. Casteel, Ph.D.
Portland State University
Portland, OR 229-3543

Patricia Hanns
Speech Biofeedback Project
2825 Commercial, SE
Salem, OR 97302 399-3300

Name/Date	Activity testing - lessons -	Students Performance Test Items 1-11	Relaxation Date	Comments

SALEM PUBLIC SCHOOLS

5.3

LANGUAGE SPEECH AND HEARING PROGRAM

TO:

FROM: Pat Hanns
Speech Clinician

DATE:

This year we are fortunate to have a Teacher Incentive Grant. This federal grant has provided the funds to buy an electromyograph or EMG.

The EMG is an instrument that allows a person to see and hear the muscle activity beneath their skin. The reason for using this is to help students develop self awareness and control of their muscle activity.

The EMG doesn't "do anything to" the student physiologically. It can, however, affect the students' understanding of that physiology and ways to deal with it that they may not otherwise learn.

In using the EMG unit, our goals would be:

1. To increase understanding that reduction or increase of muscle tension affects speech.

2. To gain voluntary control over muscle tension.

3. To learn a relaxation procedure.

4. To use skills #2 and 3 in everyday life.

The student has the choice of using or not using the EMG. Your signature on this permission form is required only if your child chooses to participate.

If data relative to this project is reported, no student names would be attached.

YES	NO	
___	___	Use of the EMG unit has been explained to me.
___	___	I give my permission for _____ (full legal name) to use the EMG unit as it seems appropriate for speech development.

Parent or Guardian _____

Service Provider _____

School Delegate _____

Student _____

Date _____

SALEM PUBLIC SCHOOLS
5.3

P. O. Box 12024 • Salem, Oregon 97309
William M. Kendrick, Superintendent

WALLACE E. TURNIDGE, Assistant Superintendent
Area II Operations
2825 Commercial Street SE
Salem, Oregon 97302
Student Services

Date

_____
_____
_____

Dear _____:

Thank you for your enthusiasm and support while _____, was participating in the Biofeedback Project.

The project took special effort from all of us. Your encouragement in what _____ was doing was vital in order for _____ to use newly acquired speech skills in everyday life situations.

The final results show that all students did grow in self-understanding and awareness. Most students also felt they were better speakers.

This has been the most rewarding year of the 12 years since I've been a speech clinician. I shall always treasure the memory of knowing and working with _____.

Sincerely,

Patricia Hanns
Speech Clinician

sk

Salem School District 24J complies with provisions of the Fair Employment Practices Act and/or Title IX Regulations in employment and educational programs and activities.

5.3

Average

NAME _____

Activity	Negative Speech Behaviors			Average		
	PRE	MID	POST	PRE	MID	POST
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						

5.3

Parent's Questionnaire

SA = Strongly Agree
A = Agree
U = Uncertain
D = Disagree
SD = Strongly Disagree

1. My child's speech has improved. SA A U D SD Other

2. My child enjoys working in the biofeedback project. SA A U D SD

3. I would like my child to continue under this project. SA A U D SD

Like _____

Dislike _____

Comments _____

Please use other side if necessary. SA A U D SD

4. Student no longer needs speech Services.

CASE	STARTED	CATEGORY	PRE-TEST ERRORS	POST-TEST	# OF AP-POINTMENTS	# OF TIMES EMG USED	ENDED	DISPOSITION
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								